3-2016

PARK MANAGEMENT GIS INTERN IN NEW YORK CITY DEPARTMENT OF PARK & RECREATION

Dongjun Zhou 3125032
dzhou@clarku.edu

PARK MANAGEMENT GIS INTERN
IN NEW YORK CITY
DEPARTMENT OF PARK & RECREATION

DONGJUN ZHOU

Degree will be conferred May, 2016

A MASTER INTERNSHIP REPORT

Submitted to the faculty of Clark University, Worcester,

Massachusetts, in partial fulfillment of the requirements for

the degree of Master of Science in the department of International Development,

Community, and Environment

And accepted on the recommendation of

Yelena Ogneva-Himmelberger, Chief Instructor

ABSTRACT

PARK MANAGEMENT GIS INTERN
IN NEW YORK CITY
DEPARTMENT OF PARK & RECREATION

DONGJUN ZHOU

My park management GIS internship with New York City Department of Parks & Recreation took place during June and August 2015, where I primarily worked under the guidance of Terese Flores, the park manager for the borough of Manhattan. My internship responsibility was assisting the Park Manager with park improvement project that primarily involved asset mapping for park properties, field data collecting and entry, budget devising as well as park staff coordinating. According to the requirement of GISDE program at Clark University, the content of this report mainly covers three aspects of this internship: the introduction for the mission and structure of this governmental organization, details of projects I involved in during summer time and an overall assessment of the 3-month internship experience.

ACADEMIC HISTORY

Name:	Date:
Dongjun Zhou	December 2015

Baccalaureate Degree:

Spatial Informatics and Digital Science

Source:	Date:
Wuhan University	May, 2014

ACKNOWLEDGEMENTS

I would like to thank Terese Flores for her patient and useful guidance throughout my intern time at New York City Department of Parks & Recreation, without her frequent assistance and suggestions, the projects I participated in won't move forward smoothly as it did, and I would not acquire a deeper understanding of the workflows for governmental management work. Hence, I really appreciate this memorable summer in the New York City, what I gained was not only the practice and refinement for my GIS technical skills, but also a deep insight of GIS application in urban planning and management based on real scenarios.

Many thanks as well to my Academic Advisor, Dr. Yelena Ogneva-Himmelberger, for her instructions and directions during my tenure as a GISDE master student at Clark University. Without her practical advice, the internship application process would become quite tough and I might miss this precious opportunity in New York City.

Finally, for Dr. Jie Tian, thank you for your useful guidance and great support to me both on academic work and personal life. During my time at Clark University, you are the great model deserves all the international students following.

TABLE OF CONTENTS

Chapter 1: Introduction

After I finished my four year Bachelor's Degree in Wuhan University, mainly focusing on GIS programming for software development, I have explored my interest in GIS application on urban planning and management, especially for transportation system due to some web-based application projects I was involved in. Hence, in order to acquire more specialization in this specific field, I decided to come to Clark University to purse a Master Degree of Geographic Information Science. Under the guidance from this GIS master program, I chose an internship track during this summer break. Fortunately, the New York City government provided a bunch of student-oriented internship positions at the same period of time, the park management GIS intern from the Department of Parks & Recreation exactly exhibits a more GIS-focused work other than additional positions, whose objective completely matched my own expectation. I found the detailed information of this internship on their official website and applied it at the beginning of April. After a phone interview directly from the park manager few days later, I finally got the internship at the end of May.

My internship responsibility was primarily assisting the Park Manager with park improvement project that involve: 1) Use GIS to map spatial data collected that can be used to manage the park and create a budget for the park's maintenance activities. 2) Enter and use the field data from data collector interns to create a report and presentation about the park. 3) Supervise and guide park staffs via GIS technics to secure their efficiency and effectiveness of daily work. The two main projects I participated in were Boat-Basin storage

basement project and asset mapping project for Sara D. Roosevelt Park, both of them will be further illustrated in Chapter 3. Chapter 2 provides details for the Department of Park & Recreation, including the organization's mission, structure and GIS-related division. The overall assessment for this internship is discussed in Chapter 4 followed by the chapter of conclusion as well as some supporting figures and literature sources.

Chapter 2: Introduction to the New York City Department of Parks & Recreation

2.1 Organization's mission

The mission of the New York City Department of Parks & Recreation is to enrich the quality of life for all New Yorkers. Public parks are vital to New Yorkers, serving as both back and front yards, promoting physical and emotional well-being and providing venues for fitness, peaceful respite and making new friends.

The department are investing in parks' infrastructure, waterfront and new recreational facilities, with an innovative focus on accessibility and sustainability. With limited room for growth in New York City, the department is converting existing industrial space into some of the greatest parks of the 21st century------ranging from the chain of parks along the restored Bronx River, to the Brooklyn Waterfront, to the iconic elevated High Line.

The commitment to greening New York City reduces air pollutants and creates a healthier urban environment. As a leader in the environmental field, Parks plays a crucial role in citywide efforts to improve natural resource management, combat global climate change, and ensure a sustainable future for neighborhoods in all five boroughs.

2.2 Organization's location and main areas of expertise

In 1733, the first official park in New York City was established: Bowling Green. This half-acre of land in lower Manhattan was acquired to provide a recreational area for the city's inhabitants. Since then, with the consolidation of the five boroughs and official creation of the agency in the 1930s, the parks system has expanded tremendously during this 80 years.

Today, NYC Parks act as the steward of about 29000 acres of land, about 14 percent of New York City, including more than 5000 individual properties ranging from Coney Island Beach and Central Park to community gardens and green streets. According to the official statistics, more than 800 athletic fields, nearly 1000 playgrounds, 48 recreational facilities, and 14 miles of beaches are operated by the Park Department. Furthermore, the NYC Parks who acts as New York City's principal providers of recreational and athletic facilities and programs, also takes control of 1200 monuments and 23 historic house museums as well as looks after 600000 street trees and two million more inside of parks.

Maintaining, rebuilding and creating parks is an ongoing process. While new parks are created, old parks refurbished, or trees planted, it in recognition not only of the needs of current park users, but also the needs of future generations. Just as advocates and planners had the foresight to establish neighborhood parks and flagship parks such as Central Park and Prospect Park more than on hundred years ago, the department is responsible for maintaining and creating parks to ensure vitality well into the future.

2.3 Organization's structure

In the first place, the Commissioner' Office oversees all aspects of the agency and all divisions and departments, working with the Mayor's Office, elected officials, community groups, and parks staff.

For the next stage, the New York City Department of Parks & Recreation primarily consists of several divisions as indicated below:

Capital Division

The Capital Projects Division of NYC Parks designs and constructs parks, playgrounds, and buildings on New York City parkland and works in partnership with outside agencies and contractors on hundreds of projects each year. The division employs 400 full-time people including landscape architects, architects, engineers, construction project managers, surveyors, attorneys, budget analysts and administrative staff members. Under the Bloomberg Administration, $6 billion has been allocated to Parks for building and renovating its parks.

Community Outreach Division

The Community Outreach Division oversees all NYC Parks interactions with the local, state, and federal government. On a daily basis, they prepare testimonies for City Council hearings and respond to the needs of community representatives and advocates. The division works closely with neighborhood groups to provide free annual educational

events, art exhibits, and lecture series, which allows for communities to become more connected to the excellent resources provided for them.

Maintenance and Operation Division

The Operations Division managers the maintenance and operations of all 1800 NYC parks and playgrounds, buildings and facilities. This division employs carpenters, electricians, foresters---even blacksmiths---who are responsible for maintaining and servicing the equipment necessary for park upkeep. Another key operation is the rigorous ongoing Parks Inspection Program (PIP). This program applies objective criteria for up to 16 different features, reporting on conditions such as litter, playground equipment hazards or hanging tree limbs. These criteria are reviewed in over 5000 ongoing random inspections year-round at parks and playgrounds to ensure the beauty and safety of parks in New York City.

Management and Budget Division

NYC Parks' division of Management and Budget oversees 19 departments including Budget, Personnel, Revenue, MIS, Operations & Management Planning, the Parks Opportunity Program (POP), Marketing and Special Events. This past year, the Budget office managed the agency's $338 million expense budget, submitted needs proposals and expense impacts for all capital projects, tracked agency contract expenditures, reviewed equity actions to ensure pay fairness, and served as the agency's primary liaison with the Office of Management and Budget on all expense budget issues.

2.4 GIS division in the organization

The GIS and mapping department is within Maintenance and Operation Division of NYC Department of Parks & Recreation, which is responsible for repair and maintenance of all park properties and regulation of all park events and activities. The GIS staffs in this agency primarily focus on using GIS skills to accurately map any spatial data collected for the park properties that can be used as a reliable and official guidance towards park management and budget estimation for the park's maintenance or improvement activities.

2.5 Organization's strength and efficiency

The work of the agency is not limited to the the maintenance of 14% of New York City's land. Act as the City's leading programmer of cultural, athletic and social activities, parks also hold a lot of fascinating public annual events such as Winter Jam, Adventures NYC, and the Pumpkin Festival. In addition, many special events are produced by park during all year around, like concerts and movie premieres, as well as free rental equipment for skating, baseball, and miniature golf.

Considering the great effort from Park agency, New Yorkers has seen a remarkable expansion of this system in the past decades, with new parks, recreational facilities, and amenities opening across the five boroughs. On Manhattan Island, much needed parkland is fulfilled by the unique High Line. With the creation of Brooklyn Bridge Park, the Brooklyn's once-abandoned industrial waterfront is revitalized. In Queens, the place where

huge gas tanks once stood is flourished by Elmhurst Park. The new Freshkills on Staten Island will cover 2200 acres of former landfill and the Bronx River was transformed into a significant waterway instead of a reception of urban dumping.

Chapter 3: Internship responsibility

Generalization

As a graduate student intern in the Maintenance and Operation Division of New York City Department of Parks & Recreation, I primarily worked under the guidance of park manager Terese Flores, and equally interacted with all other interns and staff in the same group to share ideas and access each other's work. After first week's orientation activities which introduced the organization's background and mission, I quickly entered my working status. The two main project that I was involved in were a single project of the boat-basin storage basement mapping and a team project of Sara D. Roosevelt Park asset mapping. Other tasks included data entry for New York City tree count web mapping application as well as statistical counting for several parks' visitors.

3.1 The boat-basin storage basement mapping project

My first project was the GIS mapping work for the boat basin secured storage system. The Boat Basin, located at the end of the west 79th street in Manhattan, acts as the main storage basement for the most maintenance equipment serving the Riverside Park, which is one of the famous and attractive parks in New York City due to its beautiful landscape, clean environment as well as interesting bike trail. However, during the summer period of time, my park manager's primary responsibility was the management work of the East River Park

below the Williamsburg Bridge, which was still under development compared with the fully developed Riverside Park. Hence, in order to improve the total visual impression of the East River Park, my park manager decided to use boat basin storage system as a good model to devise a budget for the maintenance equipment purchase and storage basement construction in the East River Park.

Therefore, my primary work was to digitize a highly accurate map (see fig.1) for the Boat Basin storage area, which will be further utilized as a reliable reference for the budget devising. The map data was partially from New York City Department of Transportation (DOT), the structure blueprint of Boat Basin storage output from AutoCAD and some on-field verification data measured by myself and other interns. The first step was the data preparation work, once I acquired the Boat Basin storage structure image, I imported it into ArcGIS as the base reference image for the subsequent digitizing work. Next, I connected to the DOT geodatabase in the Arc catalog and retrieved the main street layer for Manhattan Island to overlap upon the base image. As all the data preparation work was ready, the digitizing work started. The primary module I used in Arc map was the editor tool bar, according to the several control points in the base image as well as the street boundary, I firstly outlined the rough boundary of all the storage basements. Next, based upon the size and shape data for each storage basement measured by myself and other interns, I utilized trace tool combined with end point arc segment tool inside of editor module to digitize each storage basement area into separate polygon features. The acceptable discrepancy between the measured data and the digitizing data was one feet, so I spent a short period of time to

refine the polygon features in order to ensure their accuracy level. As the digitizing work had finished, the next step was attribute editing. I divided the storage basements into two category, secured basement or indoor basement, and further recorded in the type field of attribute table. Also, I initialized two new attribute fields to record two geometric areas of each storage basement calculated from polygon geometry in the Arc map and field data respectively, another assessment field generated from the proportion between these two area results was added to evaluate the accuracy of digitizing work for each storage basement. After finishing the attribute editing work for all storage basements, the last step was the map formalization. Considering it was a governmental map of New York City Park & Recreation Department, there were some basic principles the map should follow. According to the specific requirement from official New York City Parks map guidelines, the map data was symbolized with specific color palette. Additionally, I added basic map elements, including park logo, map title, north arrow, scale bar, legend as well as data sources declaration, onto the map and further adjusted the layout of these elements based upon provided template. Eventually, this public-facing map was exported as high-resolution PDF file with 300 PPI setting.

In terms of the final budget devising process, I compared the total secured storage area in Boat Basin with the current secured storage area in East River park which is calculated from the landscape map (see fig. 2) we made in the same way, once the ratio of two park's green area had been acquired, According to the official record chart of park property from Riverside Park office, I used the number of maintenance equipment counted,

such as lawn mowers or weeding machines, to create a budget report for how many maintenance equipment should be purchased for the East River Park, as well as how many more area of storage basement should be built for the East River Park.

3.2 The Sara D. Roosevelt Park asset mapping project

My second project was the asset mapping project for the whole Sara D. Roosevelt Park as well as inside Mfinda Garden. The Sara D. Roosevelt Park, located in lower east side of the New York City borough of Manhattan, which stretches three blocks in north-south direction between East Houston Street and Canal Street in Chinatown. This parks offers playing surface for several sports, including six basketball courts, roller skating rink, two soccer fields and two handball fields. The first day I came here, the famous NBA point guard Steve Nash was just holding a charity soccer match in one of the soccer field. Even though treated as a widely used green area for the neighborhood, the Sara D. Roosevelt Park seems to be the dirtiest and messiest park in the New York City due to lack of systematic management and planning. Many aspects need to be improved inside the park, such as rugged sidewalk surface, broken benches, polluted garden bed as well as disgusting litter everywhere. Therefore, my park manager wanted me to help her digitize a highly accurate asset map (see fig. 3,4)with different land features' condition for the entire park, which will be used as a reliable reference for the further management work including the distribution of park staff for weeding, litter cleaning, rats eliminating and the sidewalk brick surface

repairing.

Normally, the public-facing map in the Park agency was digitized based upon the street data from the New York City Department of Transportation geodatabase. For example, they had provided a polyline layer called center line of the street, if the agency wanted to digitize sidewalks inside any park, they can easily buffer around the center line of the street segment according to the sidewalks' width to generate corresponding sidewalk layers. However, the geospatial data for the Sara D. Roosevelt Park was partially correct, we cannot ensure the accuracy of center line data inside this park, the only data with one hundred percent accuracy was the borderline of main road bed, which would be also treated as the outside boundary of the park or the basic spatial reference for the later digitizing work. On the other hand, the fact that Sara D. Roosevelt Park was covered by dense canopy layer illustrated why the remote sensing images was useless in this scenario. Hence, the first step of this project was field data measurement for different land features, especially for the sidewalks and garden bed which totally covered half area of the park. Considering the Sara D. Roosevelt Park to be a really extensive green area spanning three blocks, four data collector interns were assigned to my team to assist me with the data collection work. Before the field work, my team attended a workshop teaching how to use the professional instruments for field data measurement, which included the use of distance measuring wheel, the choice of different measuring tape, the data discrepancy analysis as well as the efficient method for data recording. The data collection work for the whole park lasted approximately two weeks, during that period of time, with the help of data collector interns, we measured all the length,

width, and slope data for every land feature segments and park properties, from sidewalks, garden bed to public facilities, sport fields, that might be significant for the subsequent map digitizing work. In order to ensure the field data accuracy, for each measuring process, the data collector interns would perform repetitive measurement for three times and then calculate the average to be recorded as final result.

As field data collection work finished, combined with the existing roadbed layer as well as the park boundary layer from Department of Transportation geodatabase, I started digitizing park features. I firstly used attribute selection to highlight the polyline boundary of the whole park, still, using the same editor module in the Arc map as the previous project mentioned, I selected trace option inside tool bar and trace along the park boundary to digitize the peripheral sidewalks into an individual polygon layer. In order to precisely control each sidewalk segment, I preset the trace options for the border length and offset based upon the field data we measured. Once the peripheral sidewalks finished, the next target was the garden bed along the sidewalks. Much similar to my last procedure, the garden bed was also digitized as a polygon layer via tracing along the adjacent sidewalk segment with proper trace-option setting. Then, it came to the most difficult part, internal sidewalks of park. In consideration of their irregular shape and multiple directions, I decided to deal with them segment by segment. To be more specific, some regular straight sidewalks could be easily handled with the trace tool, but if I faced some curving sidewalks, such as the complex artificial trails inside Mfinda Garden (see fig. 4), I would introduce a scientific method I learned from training session to help my digitizing work. Here is a brief illustration

for the method: For a curving part of one sidewalk segment, instead of calculating its radius of curvature, I selected a nearest straight border as reference and further measured the distance from the border to the curve every five feet, each time, I was able to specify a control point located right on the curving border, then, as I connected all the control points using end point arc segment tool, the curving sidewalk border would be naturally generated with quite high accuracy. After the sidewalks and garden bed layer were fully digitized, the subsequent part of work mainly aimed at the park properties, including public facilities, office buildings, playgrounds as well as several kinds of sports fields. Similarly, with several kinds of drawing options inside editor module, I accurately digitized all the required park properties into separate layers on the basis of our field data which provided their spatial location as well as shape information.

When all the necessary layers had been digitized with satisfying accuracy level, the next step was data entry process for all the land features or park properties condition. Based on the official brochure for standard park features or properties as well as the field data we measured, I input the condition for each park feature into their corresponding attribute table in convenient for subsequent query and management work. As before, the last step was map formalization. Considering it was a public-facing map from governmental agency, this process should follow some basic principles from New York City Parks map guidelines. Each map layer data was symbolized with specific color palette and basic map elements had been added onto the map, including park logo, map title, north arrow, scale bar, legend as well as data sources declaration. The layout view for the whole map was adjusted according

to the provided template, I finally exported this landscape map into a high-resolution PDF file with 300 PPI setting. Fortunately, the commissioner meeting for Sara D. Roosevelt Park was held at the last week of internship, so I got the precious opportunity to present my final asset map to the park commissioner and all work staff.

Chapter 4: Internship assessment

Worked as a park management GIS intern in the New York City Department of Parks & Recreation was a period of unforgettable experience. What I gained from this internship was not only the GIS-related technical skills, but also some familiarity and understanding towards management work from governmental agency that located at one of the most prosperous cities in the world. The GIS work for this internship was not really challenging, mainly consisted of map digitizing, data entry as well as basic spatial analysis, however, this internship taught me the preciseness and patience to every detail for most public-facing work, especially for the time-consuming asset mapping. On the other hand, different from the free academic atmosphere in campus, the governmental agency emphasized more on strict rules and regulations in order to ensure the work efficiency and consistency.

My GIS-related coursework at Clark University and previous undergraduate school proved to be really helpful while interning with park agency. Benefit from the previous learning and practicing of map digitizing work in the vector GIS course, I was able to quickly enter working status to apply my skill into relevant projects with minimum time for adaptation. Also, the familiarity with ArcGIS software suite as well as the basic spatial database operation substantially facilitated my workflow in the two projects. However, there were still some aspects I was quite unfamiliar with and need further learning. In particular, I learned several kinds of scientific field data recording methods which paved the way for subsequent digitizing work. Also, I acquired deeper understanding of the digitizing module

in Arc map and attempted to use different combination of available tools to improve the overall accuracy of digitized features. Moreover, in terms of the final map formalization, the official map guideline assisted me to make the asset map into a more formal and professional style, which was really beneficial to my later map making work at Clark University.

As a master student majored in geographic information science, this internship certainly related to my course of studies to some degree that it had applied the GIS technical skills I learned during last five years into some practical scenarios of urban planning and management. Considering my strong interest towards GIS application in urban planning field, which exactly matched the goal of this park management GIS internship, it had been a great honor for me to work as an intern in the New York City governmental agency.

Every year, the New York City government will provide a bunch of student-oriented internship opportunities during the summer time, not only the Park & Recreation Department, other agencies such as Department of Transportation, Department of Information Technology and Telecommunication, Department of Sanitation and so on, all of them will possibly offer several well-paid summer internships related to GIS field. Thus, if any GISDE students had the same interest of GIS application in urban planning or they expressed a strong tendency to work for the governmental agency, I would highly recommend this internship for them. The New York City governmental system have established thorough and specific schedule for each internship position, providing students a great opportunity to accumulate real working experience in the governmental organization. Also, the colorful intern events during every weekend are regarded as another fantastic opportunity to explore

this glamourous city.

Chapter 5: Conclusion

As a graduate student majored in geographic information science, whose interest mainly focuses on GIS application in urban planning, it has been a great honor and fortune for me to work as an intern in the New York City Department of Parks & Recreation during this summer time.

Under the guidance and direction from my supervisor Terese Flores, an energetic and responsible park manager for the borough of Manhattan, I was able to flexibly apply the GIS technical skills that I had learned at Clark University into real urban planning and management scenarios, which not only refined my skill sets, but also brought back with me a deeper understanding of how the geographic information science was contributing to the public society.

The working environment for park agency is relaxed but efficient, I really enjoyed the three-month I spent there with so many friendly staff as well as creative interns with different cultural background. As the problems arose, we frequently shared ideas with each other to fulfill the goal of our public-facing projects together.

In conclusion, my course of studies has been reinforced and supplemented by this park management GIS internship, which also provided me with an invaluable experience both as a student and practitioner of GIS.

FIGURES

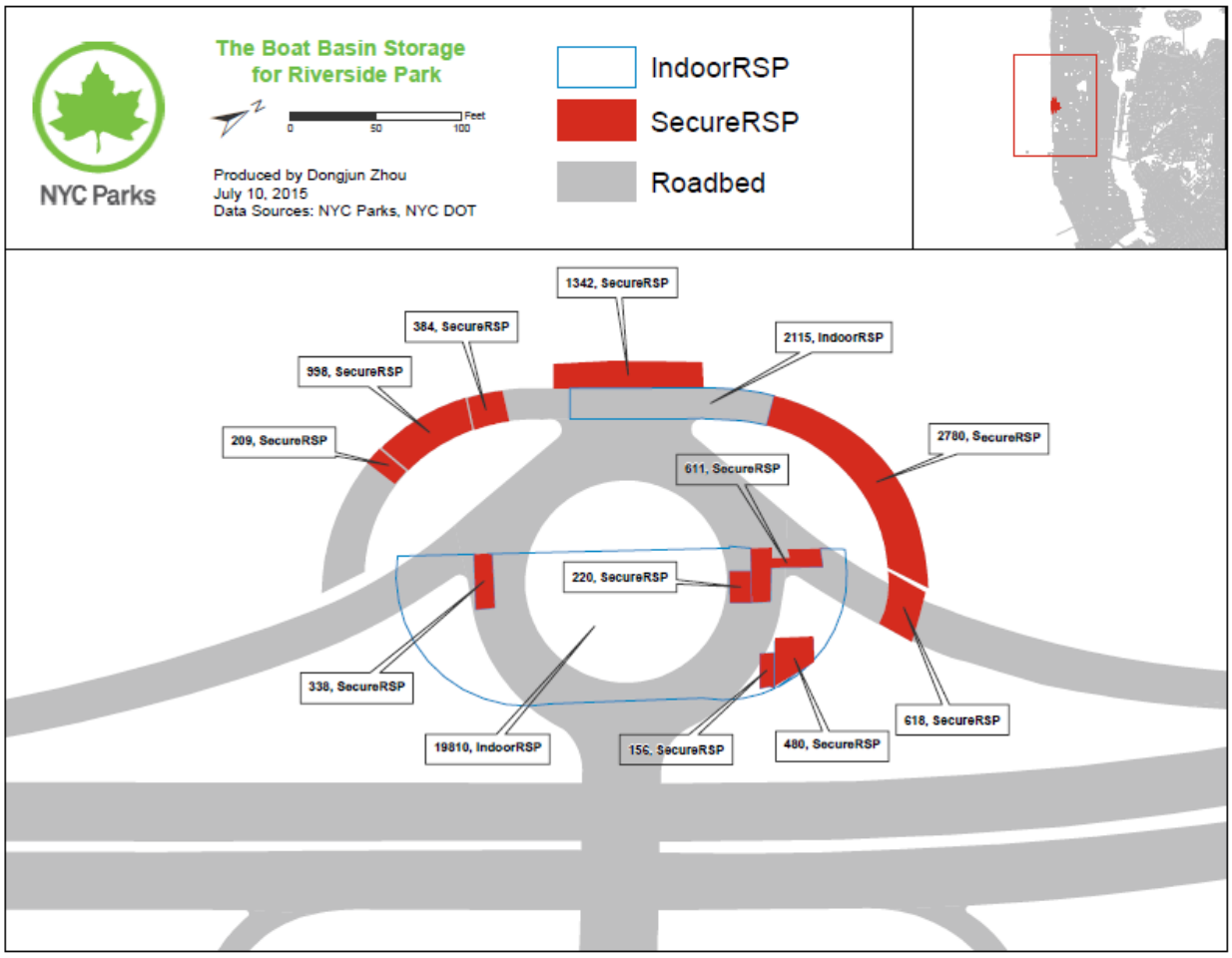

Figure 1 Boat Basin Storage Basements Map

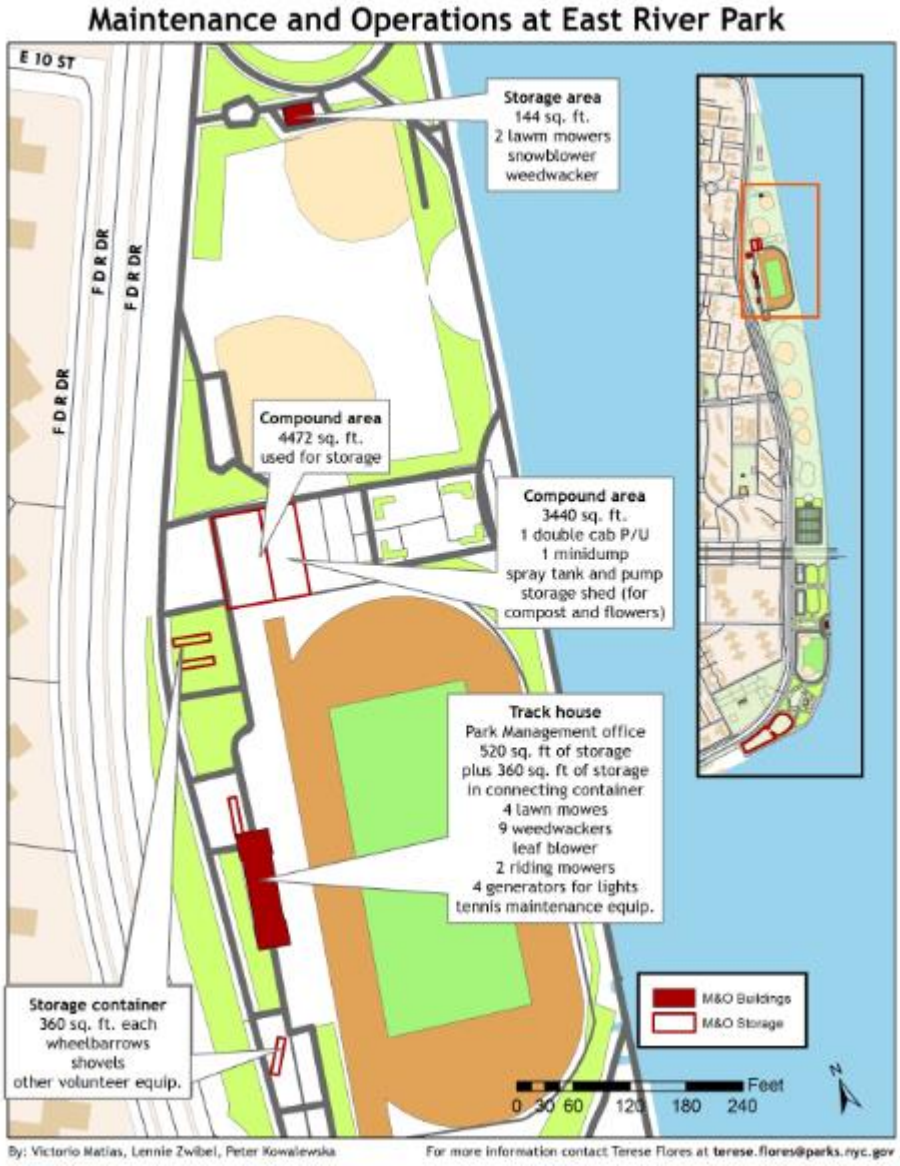

Figure 2 Maintenance and Operation Map for East River Park

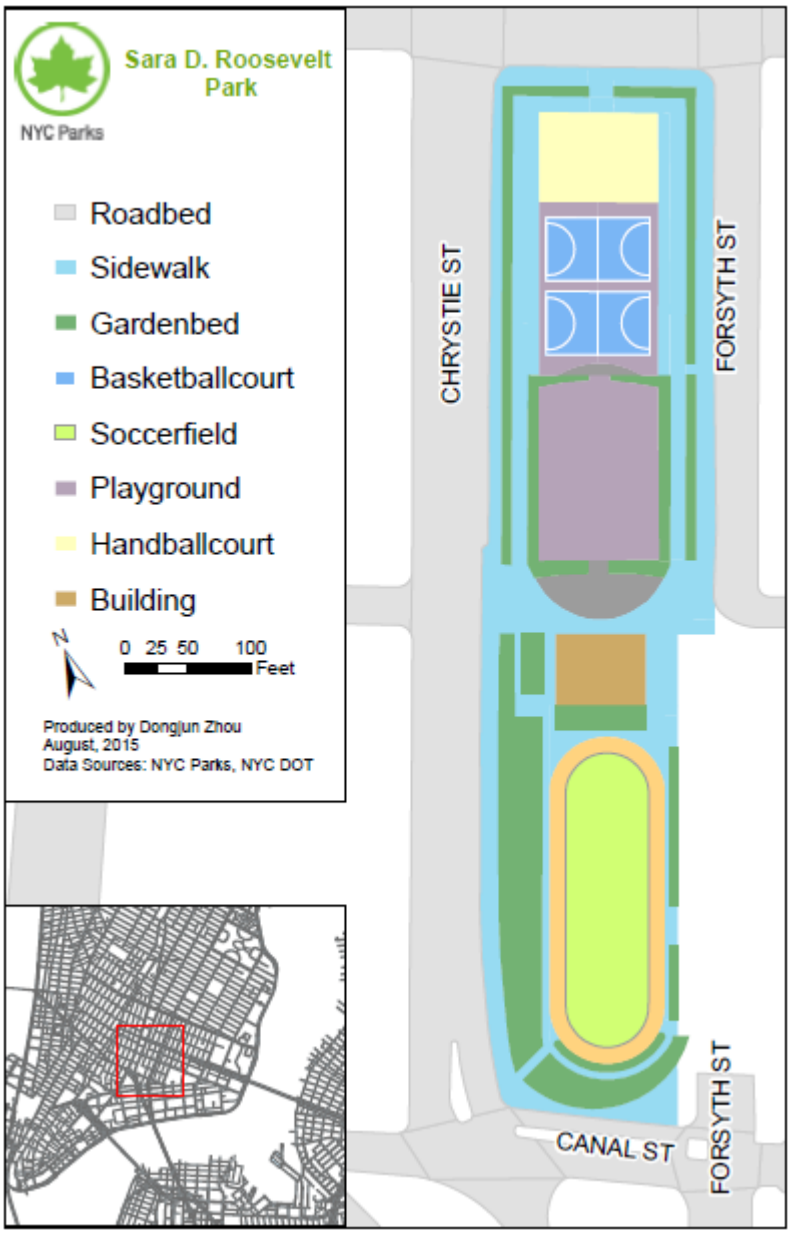

Figure 3 Asset Map for Sara D. Roosevelt Park

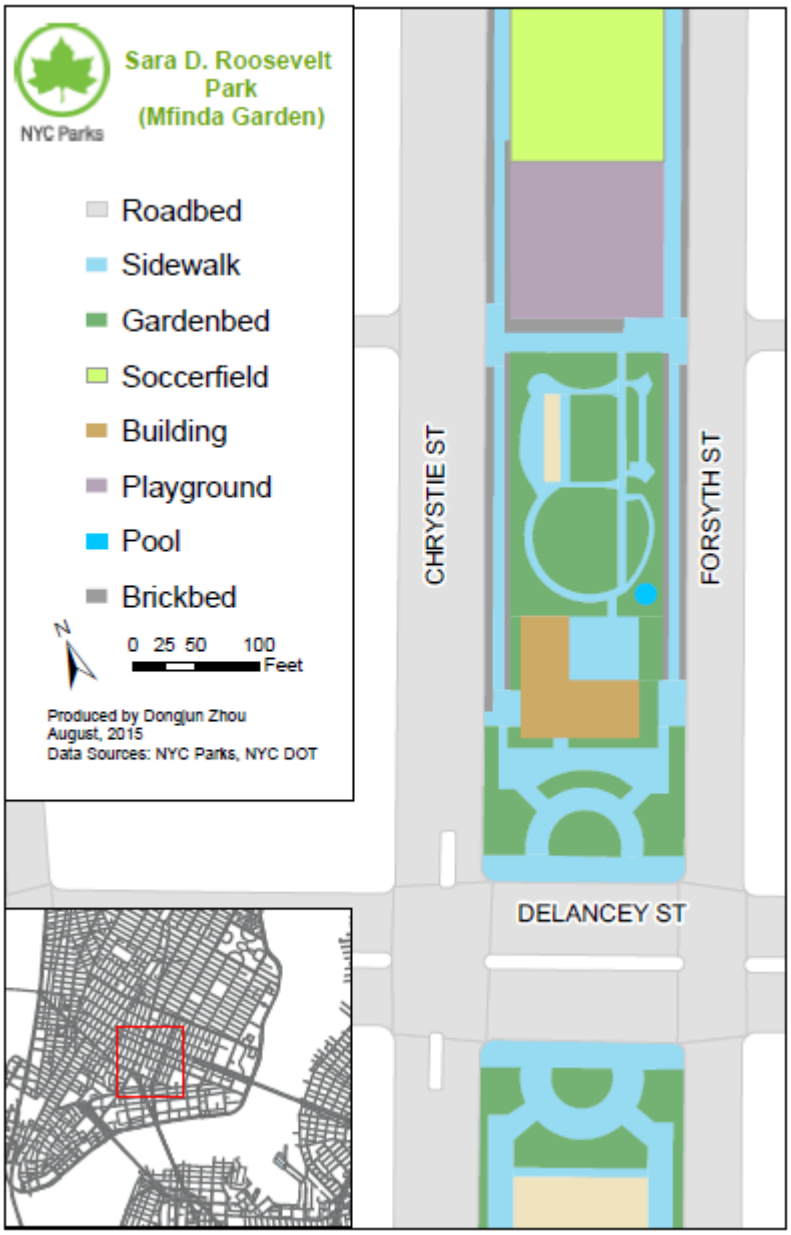

Figure 4 Asset Map for Sara D. Roosevelt Park (Mfinda Garden)

BIBLIOGRAPHY

New York City Department of Parks & Recreation, 2015, NYCP15 Summer Intern Manual 2015

New York City Department of Parks & Recreation, 2015, DPR 116 -Park Management Intern G.I.S. Intern Description

New York City Department of Parks & Recreation, 2015, Trees Count 2015 Training Manual